FINAL EXPRESS TERMS
OF PROPOSED BUILDING STANDARDS
OF THE DIVISION OF THE STATE ARCHITECT - STRUCTURAL SAFETY

REGARDING THE 2001 CALIFORNIA BUILDING CODE
CALIFORNIA CODE OF REGULATIONS, TITLE 24, PART 2

Chapters 16A, 22A, and Chapter16B - Division IV

LEGEND FOR EXPRESS TERMS
1. Existing California amendments or code language being modified: All such language appears in *italics*, modified language is underlined.   2. New California amendments: All such language appears *underlined and in italics*.   3. Repealed text: All such language appears in ~~strikeout~~.   4. Code language modified as a result of public comment appears as double-underlined.   5. New California amendments as a result of public comment. All such language appears *double-underlined and in italics.*   6. Repealed text as a result of public comment: All such language appears in ~~double-strikeout.~~

EXPRESS TERMS

Section 1627A

Amend Section 1627A to the following:

SECTION 1627A - DEFINITIONS

For the purposes of this division, certain terms are defined as follows:
…

INCIDENTAL STRUCTURAL ALTERATIONS OR ADDITIONS *are alterations or additions which would not reduce the story lateral shear force-resisting capacity by more than 5 percent or increase the story shear by more than 5 percent in any existing story.*
…

IRREGULAR STRUCTURE *is a structure designated as having one or more plan or vertical irregularities.*

LATERAL-FORCE-RESISTING SYSTEM is that part of the structural system designed to resist the Design Seismic Forces.
…

Section 1629A.8

Amend Section 1629A.8 to the following:

1629A.8 Selection of Lateral-force Procedure.

1629A.8.1 General. Any structure may be, and certain structures defined below shall be, designed using the dynamic lateral- force procedures of Section 1631A.

1629A.8.3 Static. The static lateral force procedure of Section 1630A may be used for the following structures:

1. *Not adopted by ~~the State of California~~ DSA.*

2. Regular structures under 240 feet (73 152 mm) in height with lateral force resistance provided by systems listed in Table 16A-N, except where Section 1629A.8.4, Item 4, applies.

3. Irregular structures *with flexible diaphragms not more than three stories or 30 feet (9144 mm) in height.*

4. Structures having a flexible upper portion supported on a rigid lower portion where both portions of the structure considered separately can be classified as being regular, the average story stiffness of the lower portion is at least 10 times the average story stiffness of the upper portion and the period of the entire structure is not greater than 1.1 times the period of the upper portion considered as a separate structure fixed at the base.

5. Wood-frame structures having wood shear walls and wood diaphragms.

6. Irregular structures with reentrant corners, plan irregularity Type 2, Table 16A-M, which are otherwise eligible for static analysis.

1629A.8.4 Dynamic. The dynamic lateral-force procedure of Section 1631A shall be used for all other structures, including the following:

1. Structures 240 feet (73 152 mm) or more in height.

2. Structures having a ~~stiffness, weight or geometric~~ *plan or* vertical irregularity ~~of Type 1, 2 or 3~~, as defined in Tables 16A-L *or 16A-M*, ~~or structures having irregular features not described in Table 16A-L or 16A-M,~~ except as permitted by *Section 1629A.8.3 and* Section 1630A.4.2.

3. Structures over five stories or 65 feet (19 812 mm) in height in Seismic Zones 3 and 4 not having the same structural system throughout their height except as permitted by Section 1630A.4.2.

4. Structures, regular or irregular, *except those defined in Section 1629A.8.3, Items 3 and 5,* located on Soil Profile Type S_F, that have a period greater than *0.5* second *as calculated in accordance with Method B in Section 1630A.2.2*. The analysis shall include the effects of the soils at the site and shall conform to Section 1631A.2, Item 4.
…

Section 1629A.9 Amend Section 1629A.9 to the following:

1629A.9 System Limitations.

1629A.9.1 Discontinuity. Structures with a discontinuity in capacity, vertical irregularity Type

5 as defined in Table 16A-L, _are not permitted_. ~~shall not be over two stories or 30 feet (9144 mm) in height where the weak story has a calculated strength of less than 65 percent of the story above.~~

> ~~**EXCEPTION:** Where the weak story is capable of resisting a total lateral seismic force of Ω_o times the design force prescribed in Section 1630A.~~

1629A9.2 Undefined structural systems….

1629A.9.3 Irregular features….

1629A.9.4 Severe Soft Story. _Structures with a severe soft story vertical irregularity Type 1b, as defined in Table 16A-L, are not permitted._

1629A.9.5 Severe torsional irregularity. _Structures with a severe torsional irregularity, plan irregularity Type 1b, as defined in Table 16A-M are not permitted if N_a or N_v is greater than 1.0._

…

Section 1630A.2.2

Amend Section 1630A.2.2 to the following:

1630A.2.2 Structure Period. The value of *T* shall be determined from one of the following methods:

1. Method A: For all buildings, the value of T may be approximated from the following formula:

$$\underline{\underline{T_A = C_t (h_n)^{3/4}}} \quad \underline{\underline{\cancel{T_A = \frac{C_t (h_n)^{3/4}}{IN_v}}}} \qquad \text{(30A-8)}$$

WHERE:

…

C_t = 0.035 (0.0853) for steel moment-resisting frames.

C_t = 0.030 (0.0731) for reinforced concrete moment-resisting frames and eccentrically braced frames.

C_t = 0.020 (0.0488) for all other buildings.

Alternatively, the value of C_t for structures with concrete or masonry shear walls may be taken as $0.1/\sqrt{A_c}$. (For **SI:** $0.0743/\sqrt{A_c}$ for A_c in m2).

The value of *Ac* shall be determined from the following formula:

$$A_c = \sum A_e \left[0.2 + (D_e / h_n)^2\right] \qquad \text{(30A-9)}$$

The value of D_e/h_n used in Formula (30A-9) shall not exceed 0.9.

The value of T computed by Method A shall not be taken as larger than the value of T given by Method B. If Method B is not used to compute T, then the value of T shall be taken as

$$\frac{T_A}{IN_v}$$

…

Section 1630A.4 Amend Section 1630A.4 to the following:

1630A.4 Combinations of Structural Systems.

1630A.4.1 General. Where combinations of structural systems are incorporated into the same structure, the requirements of this section shall be satisfied.

1630A.4.2 Vertical combinations. The value of *R* used in the design of any story shall be less than or equal to the value of *R* used in the given direction for the story above.

> **EXCEPTION:** This requirement need not be applied to a story where the dead weight above that story is less than 10 percent of the total dead weight of the structure.

Structures may be designed using the procedures of this section under the following conditions:

1. The entire structure is designed using the lowest *R* of the lateral-force-resisting systems used, or

2. ~~The following two~~ *Two*-stage ~~static~~ analysis procedures may be used ~~for structures conforming to Section 1629A.8.3, Item 4.~~ *providing the structure complies with the following*:

> 2.1 The flexible upper portion shall be designed as a separate structure, supported laterally by the rigid lower portion, using the appropriate values of *R* and Δ.
>
> 2.2 The rigid lower portion shall be designed as a separate structure using the appropriate values of *R* and Δ. The reactions from the upper portion shall be those determined from the analysis of the upper portion amplified by the ratio of the (R/Δ) of the upper portion over (R/Δ) of the lower portion. *This ratio shall not be less than one.*
>
> *2.3 Where design of elements of the upper portion are governed by special seismic load combinations, the special loads shall be considered in the design of the lower portion.*
>
> *2.4 The lower portion shall have a stiffness at least 10 times the upper portion.*
>
> *2.5 The period of the entire structure shall not be greater than 1.1 times the period of the upper portion considered as a separate structure fixed at the base.*
>
> *2.6 The detailing requirements required by the lateral system of the upper portion shall be used for structural components common to the structural system of lower portion.*

2.7 If separate models are used to design the upper and lower portions, the model boundary conditions of the upper portion shall be compatible with actual strength and stiffness of the supporting elements of the lower portion.

…

Section 1630A.7 Amend Section 1630A.7 to the following:

1630*A*.7 Horizontal Torsional Moments. Provisions shall be made for the increased shears resulting from horizontal torsion where diaphragms are not flexible. The most severe load combination for each element shall be considered for design.

…

Where torsional irregularity exists, as defined in Table 16*A*-M, the effects shall be accounted for by increasing the accidental torsion at each level by an amplification factor, A_x, determined from the following formula:

$$A_x = \left[\frac{\Delta_{\max}}{1.2\Delta_{avg}} \right]^2 \qquad (30A\text{-}16)$$

WHERE:

Δ_{avg} = the average of the *interstory drift* at the extreme points of the structure at Level *x.*
Δ_{max} = the maximum *interstory drift* at Level *x.*

…

Section 1630A.10 Amend Section 1630A.10 to the following:

1630A.10 Story Drift Limitation

1630A.10.1 General…

1630A.10.2 Calculated. Calculated story drift using Δ_M shall not exceed 0.025 times the story height for structures having a fundamental period of less than 0.7 second. For structures having a fundamental period of 0.7 second or greater, the calculated story drift shall not exceed 0.020 times the story height.

> **EXCEPTIONS:** 1. These drift limits may be exceeded when it is demonstrated that greater drift can be tolerated by both structural elements and nonstructural elements that could affect life safety *or continued operation*. The drift used in this assessment shall be based upon the Maximum Inelastic Response Displacement, Δ_M.
>
> 2. There shall be no drift limit in single-story steel-framed structures classified as Groups B, F and S Occupancies or Group H, Division 4 or 5 Occupancies. In Groups B, F and S Occupancies, the primary use

…

Section 1631A.3 Amend Section 1631A.3 to the following:

1631A.3 Mathematical Model. A mathematical model of the physical structure shall represent the spatial distribution of the mass and stiffness of the structure to an extent that is adequate for the calculation of the significant features of its dynamic response. A three-dimensional model shall be used for the dynamic analysis of structures with highly irregular plan configurations such as those having a plan irregularity defined in Table 16A-M and having a rigid or semirigid diaphragm. The stiffness properties used in the analysis and general mathematical modeling shall be in accordance with Section 1630A.1.2*.* *The mathematical model of buildings with diaphragm discontinuities, as defined in Table 16A-M, Item 3, shall explicitly include the effect of diaphragm stiffness.*

Section 1631A.5.4 Amend Section 1631A.5.4 to the following:

1631A.5.4 Reduction of Elastic Response Parameters for design. Elastic Response Parameters may be reduced for purposes of design in accordance with the following items, with the limitation that in no case shall the Elastic Response Parameters be reduced such that the corresponding design base shear is less than the Elastic Response Base Shear divided by the value of *R* ~~*or the values of* V_{sc} *defined in Item 4*~~.

1. For all regular structures, * * * Elastic Response Parameters may be reduced such that the corresponding design base shear is not less than *100* percent of the base shear determined in accordance with Section 1630*A*.2.

2. ~~*Not adopted by the State of California.*~~ [For OSHPD 1 & 4 and DSA/SS] *For irregular structures with vertical irregularity Types 1a, 2,or 5, as defined in Table 16A-L, or irregular structures with plan irregularity Type 1b, as defined in Table 16A-M, Elastic Response Parameters, may be reduced such that the corresponding design base shear is not less than 125 percent of the base shear determined in accordance with Section 1630A.2.*

> ***Exception****: The Elastic Response Parameters for structures with Vertical Irregularity Types 1a or 2, as defined in Table 16A-L, or plan irregularity Type 1b, as defined in Table 16A-M, may be reduced such that the corresponding design base shear is not less than 100 percent of the base shear determined in accordance with Section 1630A.2, if no interstory drift ratio under design lateral load is greater than 130 percent of the* ~~*story*~~ *interstory drift ratio of the* ~~*interstory*~~ *story immediately above. Torsional effects need not be considered in the calculation of story drifts for the purposes of this determination. The story drift ratio relationships for the top two stories of the structures are not required to be evaluated.*

~~3. For all irregular structures, * * * Elastic Response Parameters may be reduced such that the corresponding design base shear is not less than *125* percent of the base shear determined in accordance with Section 1630A.2.~~

3. For all other structures, Elastic Response Parameters may be reduced such that the corresponding design base shear is not less than 100 percent of the base shear determined in accordance with Section 1630A.2.

~~*4. The base shear V_{sc} is determined from the following formula:*~~

$$\cancel{V_{sc} = V(SR)} \qquad \textit{(31A-1)}$$

~~***WHERE:***~~

~~*SR = the spectral ratio determined by the following formula:*~~

$$\cancel{SR = \frac{\sum_{m=1}^{n}(MPE_m PM_m)}{\sum_{m=1}^{n}(CBC_m PM_m)}} \qquad \textit{(31A-2)}$$

~~*V = the total design base shear calculated in accordance with Formula (30A-4).*~~

~~***WHERE:***~~

~~*CBC_m = spectral acceleration determined from the design response spectrum given in Figure 16A-3 for the appropriate soil type at the period of the mth mode.*~~

~~*MPE_m = spectral acceleration of the site-specific maximum probable earthquake spectrum (5 percent damping) at the period of the mth mode. The value of MPE_m need not exceed 1.5.*~~

~~*n = number of significant modes required for at least 90 percent of the total building mass to participate in the direction of interest.*~~

~~*PM_m = fraction of total building mass participating in the mth mode in the direction of interest.*~~

~~*The design base shear shall not be taken as less than V_{sc}, unless justification is provided to substantiate a level of safety equivalent to structural designs at other sites and meeting the requirements of Section 1631A.2, Item 6.*~~

The ~~corresponding~~ reduced design seismic forces shall be used for design in accordance with Section 1612*A*.

Section 1632A.6

Amend Section 1632A.2.6 to the following:

1632A.6 HVAC Ductwork, Plumbing/Piping and Conduit Systems. *All pipes, ducts and conduit shall be braced to resist the forces prescribed in Section ~~1630A.2~~. 1632A. Ductwork shall be constructed in accordance with provisions contained in Part 4, Title 24, California Mechanical Code. Pipes and their connections constructed of ductile materials (copper, ductile iron, steel or aluminum) with brazed or welded connections shall have brace spacing not exceeding that specified in Section ~~1630A.5~~ 1632A.5 or other standards approved by the enforcement agency. Pipes and their connections, constructed of nonductile materials (e.g., cast iron, no-hub pipe and plastic) or with screwed connections, shall have the brace spacing reduced to one-half of the spacing allowed for ductile material in accordance with Section ~~1630A.5~~ 1632A.5 or other standards approved by the enforcement agency.*

Seismic restraints may be omitted for the following conditions, where flexible connections are provided between components and the associated ductwork, piping, and conduit:

1. Fuel<u>, medical gas, and vacuum</u> piping less than 1 inch (25 mm) inside diameter.

2. All other piping less than 2.5 inches (64 mm) diameter, ~~except medical gas including vacuum piping,~~ or

All piping suspended by individual hangers 12 inches (305 mm) or less in length from the top of the pipe to the bottom of the structural support for the hanger. Rod hangers shall not be constructed in a manner that would subject the rod to bending moments. or

All electrical conduit less than 2.5 inches (64 mm) trade size.

3. All rectangular air-handling ducts less than 6 square feet (0.56 m2) in cross-sectional area, or

All round air-handling ducts less than 28 inches (711 mm) in diameter, or

All ducts suspended by hangers 12 inches (305 mm) or less in length from the top of the duct to the bottom of the structural support for the hanger, where the hangers are detailed to avoid bending of the hangers and their connections.

Where lateral restraints are omitted, the piping, ducts, or conduit shall be installed such that lateral motion of the piping<u>,</u> ~~or~~ duct<u>, or conduit</u> will not cause damaging impact with other systems or structural members, or loss of vertical support.
…

Section 1633A.1 Amend Section 1633A.1 to the following:

1633A.1 General. All structural framing systems shall comply with the requirements of Section 1629A. Only the elements of the designated seismic-force-resisting system shall be used to resist design forces. The individual components shall be designed to resist the prescribed design seismic forces acting on them. The components shall also comply with the specific requirements for the material contained in Chapters 19A through 23A. In addition, such framing systems and components shall comply with the detailed system design requirements contained in Section 1633A.

All building components in Seismic Zones 3 and 4 shall be designed to resist the effects of the seismic forces prescribed herein and the effects of gravity loadings from dead, floor live and snow loads.

Consideration shall be given to design for uplift effects caused by seismic loads.

In Seismic Zones 3 and 4, provision shall be made for the effects of earthquake forces acting in a direction other than the principal axes in each of the following circumstances:

The structure has plan irregularity Type 5 as given in Table 16A-M.

The structure has plan irregularity Type 1a as given in Table 16A-M for both major axes.

A column of a structure forms part of two or more intersecting lateral-force-resisting systems. ~~*For the purposes of this Section, a shear wall boundary element is considered to be equivalent to a column.*~~

> **EXCEPTION:** If the axial load in the column due to seismic forces acting in either direction is less than 20 percent of the column axial load capacity.

The requirement that orthogonal effects be considered may be satisfied by designing such elements for 100 percent of the prescribed design seismic forces in one direction plus 30 percent of the prescribed design seismic forces in the perpendicular direction. The combination requiring the greater component strength shall be used for design. Alternatively, the effects of the two orthogonal directions may be combined on a square root of the sum of the squares (SRSS) basis. When the SRSS method of combining directional effects is used, each term computed shall be assigned the sign that will result in the most conservative result.

Section 1633A.2.13.1 Amend Section 1633A.2.13.1 to the following:

1633A.2.13.1 *The design of guide rail support-bracket fastenings and the supporting structural framing shall be in accordance with Section 3030 (k), Part 7, Title 24, using the weight of the counterweight or maximum weight of the car plus not more than 40 percent of its rated load. The seismic forces shall be assumed to be distributed one third to the top guiding members and two thirds to the bottom guiding members of cars and counterweights, unless other substantiating data are provided. Minimum seismic forces shall be 0.5g acting in any horizontal direction, using allowable stress design.*

Retainer plates are required for both car and counterweight, designed in accordance with Section 3032 (c), Part 7, Title 24, California Code of Regulations. Retainer plates are required at the top and bottom of the car and counterweight, except where safety devices acceptable to the enforcement agency are provided which meet all requirements of the retainer plates, including full engagement of the machined portion of the rail. The design of the car and counterweight guide rails for seismic forces shall be based on the following requirements:

1. The lateral forces using allowable stress design shall be based on horizontal acceleration of 0.5g for all buildings.

…

6. Cab stabilizers and counterweight frames shall be designed to withstand a lateral load equal to 0.5g using allowable stress design

Table 16A-L Amend Table 16A-L to the following:

TABLE 16*A*-L—VERTICAL STRUCTURAL IRREGULARITIES

IRREGULARITY TYPE AND DEFINITION	REFERENCE SECTION
1<u>a</u>. **Stiffness irregularity-soft story** A soft story is one in which the lateral stiffness is less than 70 percent of that in the story above or less than 80 percent of the average stiffness of the three stories above.	1629*A*.8.4, Item 2
<u>***1b. Severe Soft Story***</u> <u>*A severe soft story is one in which the lateral stiffness is less than 60 percent of that in the story above or less than 70 percent of the average stiffness of three stories above.*</u>	<u>*1629A.9.4*</u>
2. **Weight (mass) irregularity** Mass irregularity shall be considered to exist where the effective mass of any story is more than 150 percent of the effective mass of an adjacent story. A roof that is lighter than the floor below need not be considered.	1629*A*.8.4, Item 2
3. **Vertical geometric irregularity** Vertical geometric irregularity shall be considered to exist where the horizontal dimension of the lateral- force-resisting system in any story is more than 130 percent of that in an adjacent story. One-story penthouses need not be considered.	1629*A*.8.4, Item 2
4. **In-plane discontinuity in vertical lateral-force-resisting element** An in-plane offset of the lateral-load-resisting elements greater than the length of ~~those~~ <u>*the*</u> elements <u>*below*</u>.	1630*A*.8.2
5. **Discontinuity in capacity-weak story** A weak story is one in which the *ratio of the story strength to the story shear is less than 80 percent of that in the story above. The story strength is the strength of all seismic-resisting elements sharing the story shear for the direction under consideration. The load deformation characteristics of the elements shall be considered so that the strength is determined for compatible deformations.*	1629*A*.9.1

Table 16A-M Amend Table 16A-M to the following:

TABLE 16*A*-M—PLAN STRUCTURAL IRREGULARITIES

IRREGULARITY TYPE AND DEFINITION	REFERENCE SECTION
1a. **Torsional irregularity-to be considered when diaphragms are not flexible** Torsional irregularity shall be considered to exist when the maximum story drift, computed including accidental torsion, at one end of the structure transverse to an axis is more than 1.2 times the average of the story drifts of the two ends of the structure.	1633A.1 1633A.2.9, Item 6
1b. ***Severe Torsional irregularity-to be considered when diaphragms are not flexible*** ***Severe*** *torsional irregularity shall be considered to exist when the maximum story drift, computed including accidental torsion, at one end of the structure transverse to an axis is more than 1.4 times the average of the story drifts of the two ends of the structure.*	*1629A.9.5* *1631B.2.9, Item 6*
2. **Reentrant corners** Plan configurations of a structure and its lateral force-resisting system contain reentrant corners, where both projections of the structure beyond a reentrant corner are greater than 15 percent of the plan dimension of the structure in the given direction.	1633A.2.9, Items 6 and 7
3. **Diaphragm discontinuity** Diaphragms with abrupt discontinuities or variations in stiffness, including those having cutout or open areas greater than 50 percent of the gross enclosed area of the diaphragm, or changes in effective diaphragm stiffness of more than 50 percent from one story to the next.	1633A.2.9, Item 6
4. **Out-of-plane offsets** Discontinuities in a lateral force path, such as out-of-plane offsets of the vertical elements.	1630A.8.2; 1633A.2.9, Item 6; 2213A.9.1
5. **Nonparallel systems** The vertical lateral load-resisting elements are not parallel to or symmetric about the major orthogonal axes of the lateral force-resisting system.	1633A.1

Section 2210A Amend Section 2210A to the following:

SECTION 2210*A* - ADOPTION

Except for the modifications as set forth in Section 2211A of this Division and the requirements of the building code, the seismic design, fabrication, and erection of structural steel shall be in accordance with the Seismic Provisions for Structural Steel Buildings, April 15, 1997 published by the American Institute of Steel Construction, 1 East Wacker Drive, Suite 3100, Chicago, IL 60601, including Supplement No. ~~1~~<u>2</u> dated ~~February 15, 1999~~ <u>November 10, 2000</u>.

Section 2211A Amend Section 2211A to the following:

SECTION 2211*A* - AMENDMENTS

The Seismic Provisions for Structural Steel Buildings, hereinafter referred to as AISC Seismic 97, shall include only Part I (LRFD) and Appendix S. Where other codes, standards, or specifications are referred to in AISC Seismic 97 they are considered as supplemental standards and only considered guidelines subject to the approval of the enforcement agency.

***1*. Part I, Glossary. Add the following:**

<u>~~Inelastic Rotation of Beam-to-Column Connection: The total angle change between the column face at the connection and a line connecting the beam inflection point to the column face, less that part of the angle change occurring prior to yield of the beam.~~</u>

Rapid Strength Deterioration: A mode of behavior characterized by a sudden loss of strength. In a cyclic test with constant or increasing deformation amplitude, a loss of strength of more than 50 percent of the strength attained in the previous excursion in the same loading direction.

…

2. Part I, Glossary. Ordinary, and Intermediate, and Special Truss Moment Frame (OMF, and IMF and STMF).

<u>**3. Part I, Section 7.3c amend this section to read as follows:**</u>

For members and connections that are part of the Seismic Force Resisting System, discontinuities located within a plastic hinging zone as defined in Section 7.4a, created by errors or by fabrication or erection operations, such as tack welds, erection aids, air-arc gouging, and thermal cutting, shall be repaired as required by the Engineer of Record *<u>and approved by DSA</u>*.

~~3~~<u>4</u>. Part I, Section 9.2 amend to read as the following:

9.2. Beam-to-Column Joints and Connections

9.2a. The design of all beam-to-column joints and connections used in the Seismic Force Resisting System shall be based upon qualifying cyclic test results in accordance with Appendix S that demonstrate an interstory drift angle of at least 0.04 radians *and an inelastic rotation of at least 0.03 radians*.

…

~~*4*~~ 5. Part I, Section 10. Intermediate Moment Frames (IMF) including Commentary Section C10.

~~*5*~~ 6. Part I, Section 11. Ordinary Moment Frames (OMF) including Commentary Section C11.

~~6~~ 7. Part I, Section 12. Special Truss Moment Frames (STMF) including Commentary Section C12.

~~*7*~~ *8*. Part I, Section 15.4b. Add the following to the end of the paragraph:

15.4b. Where reinforcement at the beam-to-column connection at the Link end precludes yielding of the beam over the reinforced length, the Link is permitted to be the beam segment from the end of the reinforcement to the brace connection. Where such Links are used and the Link length does not exceed 1.6 M_p/V_p, cyclic testing of the reinforced connection is not required if the design strength of the reinforced section and the connection equals or exceeds the required strength calculated based upon the strain-hardened Link as described in Section 15.6a. Full depth stiffeners as required in Section 15.3a. shall be placed at the Link-to-reinforcement interface. *Cyclic testing of the Link connection to the weak axis of a wide flange column is required for any length link.*

~~8. Part I, Section S2. Add the following:~~

~~S2. SYMBOLS~~

~~*θ Peak deformation (interstory drift angle) in radians used to control loading of the test specimen.*~~

***9*. Part I, Section S3. Revise to read as follows:**

S3. DEFINITIONS

…

Inelastic Rotation. The permanent or plastic portion of the rotation angle between a beam and the column or between a Link and the column of the Test Specimen, measured in radians. The Inelastic Rotation shall be computed based upon an analysis of Test Specimen deformations. Sources of Inelastic Rotation include yielding of members and connectors, yielding of connection elements, and slip between members and connection elements. For beam-to-column moment connections in Moment Frames, ~~inelastic rotation shall be computed based upon the assumption that inelastic action is concentrated at a single point located at the intersection of the centerline of the beam with the centerline of the column~~ ~~*The*~~ the inelastic *rotation is represented by the plastic chord rotation angle calculated as the plastic deflection of the beam or girder, at the center of its span divided by the distance between the center of the beam span and the centerline of the panel zone of* *the beam column connection .* For link-to-column connections in Eccentrically Braced Frames, inelastic rotation shall be computed based upon the assumption that inelastic action is concentrated at a single point located at the intersection of the centerline of the link with the face of the column.

_10_. Part I, Section S5.2. Revise to read as follows:

S5.2. Size of Members

1. The size of the beam or Link used in the Test Specimen shall be within the following limits:

   a. *At least one of the test beams or Links shall be 100% of the depth of the prototype beam or Link. For the remaining specimens ,* the depth of the test beam or Link shall be no less than 90 percent of the depth of the Prototype beam or Link.

   b. *At least one of the test beams or Links shall be 100% of the weight per foot of the prototype beam or Link. For the remaining specimens,* the weight per foot of the test beam or Link shall be no less than 75 percent of the weight per foot of the Prototype beam or Link.

...

_11_. Part I, Section S6.3. ~~Revise to~~ Add the following:

~~S6.3~~ S6.2 Loading Sequence

~~Loads shall be applied to the Test Specimen, up to the completion of the test, to produce the following deformations:~~

~~*1. 6 cycles of loading at θ□ = 0.00375*~~

~~*2. 6 cycles of loading at θ□ = 0.005*~~

~~*3. 6 cycles of loading at θ□ = 0.0075□*~~

~~*4. 4 cycles of loading at θ□ = 0.01*~~

~~*5. 2 cycles of loading at θ□ = 0.015□*~~

~~*6. 2 cycles of loading at θ□ = 0.02*~~

~~*7. 2 cycles of loading at θ□ = 0.03□*~~

~~*8. After completion of loading cycles at 0.03 □□testing shall be continued to applying cyclic loads to produce θ□equal to 0.04□ 0.05□□etc., with two complete loading cycles at each increment.*~~

…

Continue loading at increments of θ = *0.01* rad., with two cycles of loading at each step.

Or alternatively, the loading sequence may be the following:

1. 3 cycles of loading at $0.25\delta_y < \delta \le 0.5\delta_y$

2. 3 cycles of loading at $0.6\delta_y < \delta \le 0.8\delta_y$

3. 3 cycles of loading at $\delta = \delta_y$

4. 3 cycles of loading at $\delta = 2\delta_y$

5. 3 cycles of loading at $\delta = 3\delta_y$

6. 2 cycles of loading at $\delta = 4\delta_y$

7. *After completion of the loading cycles at $4\delta_y$, testing shall be continued by applying cyclic loads to produce δ equal to $5\delta_y$, $6\delta_y$, $7\delta_y$, etc. Two cycles of loading shall be applied at each incremental value of deformation.*

Other loading sequences are permitted to be used to qualify the Test Specimen when they are demonstrated to be of equivalent severity.

***12*. Part I - Section S10. Revise as follows:**

S10. ACCEPTANCE CRITERIA

For each connection used in the actual frame, at least *three* cyclic tests are required for each condition in which the Essential Variables, as listed in Section S5, remain within the required limits. All tests shall satisfy the criteria stipulated in Sections 9.2, or 15.4, as applicable. In order to satisfy *interstory drift angle and* Inelastic Rotation requirements, each Test Specimen shall sustain the required *interstory drift angle and inelastic* rotation for at least *two complete loading cycles without exhibiting rapid strength deterioration.*

Section 2213A.7.6

Amend Section 2213A.7.6 to the following:

2213A.7.6 Trusses in SMRF. *Not adopted by DSA* ~~Trusses may be used as horizontal members in SMRF if the sum of the truss seismic force flexural strength exceeds the sum of the column seismic force flexural strength immediately above and below the truss by a factor of at least 1.25. For this determination the strengths of the members shall be reduced by the gravity load effects. In buildings of more than one story, the column axial stress shall not exceed 0.4*Fy* and the ratio of the unbraced column height to the least radius of gyration shall not exceed 60. Columns shall have allowable stresses reduced 25 percent when one end frames into a truss, and 50 percent when both ends frame into trusses. The connection of the truss chords to the column shall develop the lesser of the following:~~

~~1. The strength of the truss chord.~~
~~2. The chord force necessary to develop 125 percent of the flexural strength of the column~~

Chapter 16B, Division IV

Earthquake Regulations for Seismic-Isolated Structures *[~~For DSA-SS~~ Not adopted by DSA]*

Notation:
Authority/Reference: Health & Safety Code Section 16022, Education Code Section 17310